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MINISTRY OF AVIATION

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT

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Report No. AAEE/Tech/234/Arm.

10 MAY 1963

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
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Sea Vixen Mk.1/Scimitar Aircraft

2" Rocket Firing Installation
Strengthened Nose Fairings

Presented by

Flt. Lt. C. H. Morris
Armament Division

A. & A.E.E. Ref: ARM G.3
M.O.A. Ref: AV/97/018
Period of Trial: April-October, 1962

Summary

This Report deals with the trials to clear the Improved Strength Nose Fairing (Drg. ND/7577/2) for Service use when fitted to the No.3 Mk.1 Twenty Four Tube 2" R.P. Launcher on Sea Vixen and Scimitar aircraft.

Clearance is recommended for the Improved Strength Nose Fairing for use under the following conditions when fitted to Sea Vixen Mk.1 and Scimitar aircraft:-

Heights up to 45,000 feet
Speeds up to 600 knots

and throughout the full range of manoeuvres within the limitations of the aircraft.

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Air Commodore,
Commandant, A. & A.E.E.

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1. Introduction

Clearance trials of the Improved Strength Nose Fairing for the No.3 Mk.1 Twenty Four Tube 2" R.P. Launcher were requested by the Ministry of Aviation (M.O.A. Trials Proforma AV/97/018 dated 19th March, 1962 refers) prior to its issue for Service use on Sea Vixen Mk.1 and Scimitar aircraft. These trials have been completed.

2. Object of Trial

The object of the trial was to prove the improved strength nose fairings fitted to the No.3 Mk.1 Twenty Four Tube 2" R.P. Launcher throughout the flight envelope of the Sea Vixen Mk.1 aircraft. The fairings were also to be subjected to flight through heavy rain conditions and heavy 'g' loadings. The results of the trials were to apply equally to the use of these fairings on Scimitar aircraft.

3. Description of Installation

A Sea Vixen Mk.1 aircraft was equipped as follows:

(i) 4 x 24 Tube Launchers No.3 Mk.1 (two per wing on pylons) to which were fitted:-

Inner pylons - improved strength nose fairings

Outer pylons - standard nose fairings.

(ii) High speed cameras on each wing facing inwards to record destruction of nose fairings, rocket emergence and initial flight path.

(iii) Forward facing cameras on each wing to record rocket flight path.

A Hunter Mk.6 aircraft used in the initial stages of the trials was equipped as follows:-

(i) 2 x 24 Tube Launchers No.3 Mk.1 (one per wing on pylons) to which were fitted improved strength nose fairings.

(ii) High speed cameras in the fuselage facing outwards to record destruction of the nose fairings, rocket emergence and initial flight path.

(iii) Forward facing cameras in the nose and on the port wing to record rocket flight path.

4. Method of Trial

The improved strength nose fairings were subjected to:-

(i) 2" Rockets firing through the fairing.

(ii) Normal flight conditions throughout a full range of heights and speeds (1,000 to 45,000 feet and 200 to 600 knots).

(iii) Normal handling by ground personnel before, between and after flights.

(iv) High speed/low level flights through heavy rain.

(v) Comparison under all conditions (except 'g' loading) with the standard nose fairing.

(vi) 'g' loading, straight and level, and turns, to 6 'g'.

In addition the 2" Rocket firing flights were carried out using 2" Rockets fitted with the OR.942 fuse.

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5. Results of Trial

The first five sorties were combined with the air firing of OR.942 fuzed 2" rockets at heights between 10,000 and 16,000 feet and indicated Airspeeds between 430 and 510 knots. In every case, even when only one rocket was fired, the improved strength nose fairing disintegrated satisfactorily and had no apparent effect on the rocket flight or the operation of the rocket fuze. A further thirteen flights were then made with standard rockets at speeds between 200 and 600 knots I.A.S. at heights between 1,000 and 45,000 feet.

On sortie No.10 the aircraft was flown at 500 knots through heavy thunder-storm rain in order to simulate a tropical rainstorm. The improved strength fairing was unmarked but the standard fairing was badly pitted over its upper surface up to 6 inches back from the nose. The pitting was approximately half an inch in diameter and a quarter of an inch deep.

On sortie No.11 flying at 230 knots at 45,000 feet, normal rain was encountered which caused half inch diameter blisters on the upper surface of the standard nose fairing, but left the improved strength fairing untouched. During sortie No.15, flying at 575 knots I.A.S. and 5,000 feet, the improved strength fairing collapsed and disintegrated approximately 30 seconds after attaining this speed. However, as this fairing had flown on the last eleven sorties, between each of which it was removed, stored and replaced, and had suffered two flights through rain (sortie Nos. 10 and 11) it was considered that there may have been some structural weakening which was not apparent to the eye. Therefore, it is suggested that this failure is not representative of fairings which would not normally be used on more than two flights before being destroyed by firing. This contention is borne out by the fact that on the five subsequent runs at speeds between 594 and 600 knots no failures were experienced.

One flight was made at between 5,000 and 7,000 feet during which the improved nose fairings were subjected to loadings up to 6 'g' during pull-out and from dives and in turns.

After a total of nineteen flights covering speeds between 200 and 600 knots, and at heights between 1,000 and 45,000 feet, it was considered that only flights at speeds in excess of 600 knots would be of any further value, but this Establishment had no aircraft at this time which was capable of performing this task. Therefore, to avoid further delay, the trial was terminated.

6. Conclusions

It is concluded that:-

- (i) The Improved Strength Nose Fairing offered better resistance to weathering than did the Standard Fairing, and produced no apparent adverse effects on rocket flight or fuze operation.
- (ii) The Improved Strength Nose Fairing withstood speeds up to 600 knots and 'g' loadings up to 6 'g'.

7. Recommendations

It is recommended that this Improved Strength Nose Fairing be cleared for Service use on Sea Vixen Mk.1 and Scimitar aircraft under the following conditions:-

Heights up to 45,000 feet

Speeds up to 600 knots

and throughout the full range of manouevres within the limitation of the aircraft.

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Appendix I to
Report No. AAEI/Tech/234/Arm.

Flight Details

Sortie No.	Fairings Fitted		Speed (knots)	Height (feet)	2" R.P. Fired	Remarks
	Old	New				
1	-	1	430	10,000	3	No apparent deflection of rockets. Satisfactory disintegration.
2	-	2	480	10,000	3	" " "
			480	10,000	2	" " "
3	-	2	510	12,000	3	" " "
			500	16,000	3	" " "
4	-	2	450	10,000	2	" " "
			450	10,000	1	" " "
5	-	2	450	10,000	3	" " "
			450	10,000	3	" " "
6	1	1	250-365	30,000	-	No damage to either fairing.
			250-500	5,000	-	" " "
7	1	1	250-500	5,000	-	" " "
8	1	1	250	40,000	-	" " "
9	1	1	225-475	10,000	-	" " "
10	1	1	500	5,000	-	Heavy thunderstorm rain. Improved fairing no damage. Standard fairing badly pitted to depth of $\frac{1}{4}$ inch over upper surface up to 6" back from nose.
11	1	1	230	45,000	-	Standard fairing blistered by rain. Improved fairing no damage.
12	1	1	500	5,000	-	No damage to either fairing.
13	1	1	500	5,000	-	" " "
14	1	1	200-430	20,000	-	" " "
15	1	1	575	5,000	-	Improved fairing collapsed and disintegrated after approximately 30 seconds at this speed.
16		2	594	1,000	-	No damage to either fairing.
17		2	600	1,500	-	" " "
			600	2,000	-	" " "
18		2	600	1,000	-	" " "
		2	600	1,000	-	" " "
19		2	400	5,000-7,000	-	5 runs pulling, 2 $\frac{1}{2}$, 3 $\frac{1}{2}$, 4 $\frac{1}{2}$, 5 $\frac{1}{2}$ and 6 $\frac{1}{2}$ respectively then 3 turns pulling 6 $\frac{1}{2}$ for 15 seconds each. No damage was suffered.

Flights discontinued as no aircraft available to achieve greater speeds.

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